Collaborative Creative Computing

1 WHY?

We all know that there are not enough girls and women in computing, which is disadvantageous both to women and to computing. In the UK in 2014 the proportion of girls choosing to study GCSE computing (14-16) was only 15%[1] , and similarly low (17%) on entry to university in 2015 [4].

This trend appears start between the ages of 11 and 15 [5] and although there is no one simple answer, a large part of the problem appears to be in the existence and perpetuation of negative stereotypes of the culture [2] such as

- socially isolated
- not collaborative
- masculine interests

1.1 Related Work

In our work we focus particularly on workshops for early secondary school pupils (11-13), and in particular on the collaborative creation of music using computers. Our approach is to focus less on the syntax of the code and to think more about the structure of the network: both the logical network that governs which notes are played when, and the physical network and related protocols that join the different components together. In this way we hope to be able to address not just coding issues, but broader computer science issues that we discuss below.

2 WHAT?

"Node-RED is a flow-based programming tool, originally developed by IBM's Emerging Technology Services team and now a part of the JS Foundation." [3]. Designed as a tool to allow quick and easy development of Internet-of-Things applications, it allows integration between internet services such as http requests, email, social media, and to connect them to physical devices by a range of protocols. Editing takes place in a web browser, without the need for code to be typed in (although nodes in the flow network can be defined with arbitrary javascript functions). The code itself runs on a nodejs server, which can either be deployed remotely or locally.

We have defined new node types to facilitate music-making in node-red:

beat: which generates regular beats, like a metronome

divider: which allows beats to be aggregated into bars, bars into phrases, phrases in sections etc

sequencer: which plays rhythms based on the beats that it receives

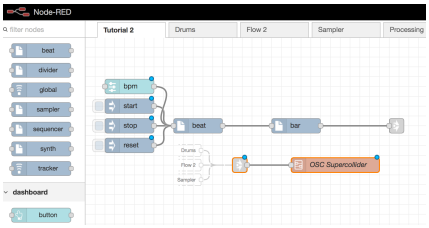

Figure 1: A node-red flow to generate beats and bars, and to forward OSC messages

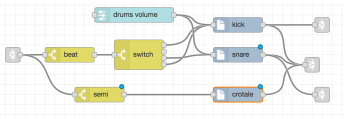

Figure 2: A node-red flow to play different drums on different beats

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synth: which creates SuperCollider messages to play sounds (to be forwarded via OSC)

sampler: which allows sounds to be recorded and played back, creating a sophisticated programmable "loop pedal"

These nodes can then be combined with standard node-red features, including browser-based UI components, to make beautiful music! Figure 1 shows a flow that allows the beat to be started and stopped, with the number of beats per minute (bpm) controlled by a UI component in a separate tab. The beats are then forwarded to other tabs, such as the one shown in figure 2, where different drums are played on different beats within a bar.

3 RESULTS

So far we have used the system in schools workshops three times, including primary and secondary, with students reporting that they found the system engaging and interesting and would like to use it again. The data we have is not enough to be significant as yet, but analysis of qualitative data is promising. We are now in a position to run larger-scale events with more detailed analysis of the impact.

REFERENCES

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